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**BLOOD PRESSURE AND THE EFFECT OF CALCIUM  
ENRICHED MILK IN HUMANS WITH NORMAL OR  
MILDLY ELEVATED BLOOD PRESSURE:  
METHODOLOGICAL CONSIDERATIONS**

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## ABSTRACT

The aim of the present study was to assess the influence of three different milk products on blood pressure in patients with mild hypertension who were not under medication or had ceased medication for the trial period under medical supervision. In addition, the effect of calcium on blood pressure was to be explored.

The initial objectives of the trial were not met because the trial was stopped due to an adverse coronary event in one volunteer. However, there was sufficient data to reinforce the validity of the methodology, especially the ambulatory blood pressure recording, and to ensure that all other aspects of the trial were achievable.

Subjects with elevated blood pressure could be recruited and undergo a series of tests to determine their physical parameters, have blood pressure taken by a variety of methods and on several occasions, and meaningful data obtained. In addition, a small, potentially beneficial, modification could be made to their diet, and the effect of this dietary change monitored by both blood pressure and blood profile changes. These changes were made with minimal disruption to their daily routine, and were generally well-received.

The present study confirmed that ambulatory blood pressure monitoring could be conducted with little intrusion into the lives of the subjects. The data obtained from a variety of methods was able to identify those subjects who presented with some of the cluster of factors which characterise Syndrome X.

These results, while only from a small sample group, strongly support the use this research methodology to provide an accurate representation of a population subgroup, such as those with elevated blood pressure. In addition, the effect of a dietary intervention on blood pressure and blood lipid profiles can be monitored in free-living subjects.

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## CHAPTER ONE: INTRODUCTION

Elevated blood pressure is an increasing problem in industrialised nations, especially as the population ages (Levy, D., 1999) and becomes more obese (Whelton *et al.*, 1998: New Zealand Guidelines, 2000).

It has been demonstrated by numerous studies that adequate calcium lowers blood pressure (Buonopane *et al.*, 1992; Osbourne *et al.*, 1996; McCarron, 1998; Barr *et al.*, 2000). Sufficient calcium in the diet may have a greater effect on people who have elevated blood pressure. Known as hypertensives, these people usually submit to a drug regime to control their blood pressure. Simply drinking a daily glass of calcium-reinforced milk provides an attractive alternative. Calcium-enriched fat-free milk is currently available on the New Zealand market, as the benefits of sufficient calcium in the diet are well-recognised (Karanja *et al.*, 1994). These benefits are for both osteoporosis and blood pressure reduction (McCarron, 1998). The former relationship is well established, however the latter is somewhat controversial (Seely, 1991; Buonopane *et al.*, 1992; Osbourne *et al.*, 1996; McCarron, 1998; Barr *et al.*, 2000).

Fat offers enhanced flavour to most products, therefore there is market resistance to fat-free products. This observation prompted the milk industry to explore the effect of a low-fat calcium-enriched milk that is currently unavailable on the market. The low fat content may offer improved flavour and therefore increased sales, but the health benefits of the calcium may be offset by the increased potential of raised blood cholesterol levels. This effect is especially important for those with elevated blood pressure, who may further compromise their health by consumption of such a higher fat product.

Control of blood lipids is a means of reducing the risk of cardiovascular disease (Karanja *et al.*, 1994). Dairy food consumption has been linked to the development of arteriosclerosis (McNamara, 1992), thus people with an increased risk of cardiovascular disease are usually encouraged to reduce their intake of these foods. However, the strong link between calcium and blood pressure begs the investigation whether the potential benefit of consuming calcium enriched milk outweighs any potential harm of dairy fat.

A nine-week trial was conducted to determine if drinking modified milk powder lowered blood pressure. The purpose of this study was to assess the influence of three different milk products on blood pressure in patients with mild hypertension who were not under medication or had ceased medication for the trial period under medical supervision. The three milk products were normal skim milk; normal skim milk with added calcium; and low fat milk (1.5% fat) with added calcium. These were formulated by the New Zealand Dairy Research Institute. In addition, the effect of the higher fat milk on blood lipids was also to be explored.

The 9-week trial was stopped prematurely after only three subjects had completed the measurements and, therefore, the number of subjects is limited. The purpose of the thesis was revised to assess in more detail the suitability of the various methodologies for this kind of intervention trial.